

# The Combination of Alternating Ultra-Narrow Coulomb Force Lines with LASER Epitaxy for the Formation of Metal Grate-Like Structures in Electrolysis Device Cathodes to Reduce Corrosion in Current-Generation Cathode Materials via the Prevention of Current Flow "Hotspots"

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## Introduction

The problem of cathode corrosion in electrolysis cathodes is quite distinct from the challenges involved in preventing anode distortion in lithium ion batteries. One is a gradual process occurring over time caused by repetitious exertion of infinitesimal magnetic fields, but the former is a process that happens in spurts that researchers find difficult to anticipate in terms of location or timing.

## Abstract

Rather than focusing only on researching novel cathode materials, the physical orientation of molecules of which these cathodes are composed can be tailored during the cathode manufacturing process so as to increase the longevity of cathodes. Impurities in the water or other materials being dissociated can result in short-lived pockets of increased current flow that can cause substantial chunks of the cathode to separate from the overall cathode abruptly.

Asymmetry of flow can also be triggered by the orientation of molecules comprising the cathode, itself, as a result of certain chance alignments similar to the ones found in semiconductors in CMOS sensors which create unique patterns of sensor noise in photographic outputs of camera systems. Novel cathode materials incorporating unconventional elements have been demonstrated to extend cathode longevity, but detailed explanation for this improvement has proven elusive.

One possible explanation for the improvement seen in these new materials is that the incorporation of additional atoms of certain elements at certain positions on well-proven molecules changes the overall shape of the molecules in order to cause them to be less oblong and closer to the shape of a "plus sign." When these molecules are oblong, the chance linear formation of sequences of molecules can result in increased current flow in those zones and reduced current flow in surrounding zones. Plus sign-shaped molecules prevent this effect, to a great extent, resulting in a net reduction in cathode wear over time.

It is easy to understand why this occurs by considering the analogy of a poorly-constructed brick wall in which one of the bricks has double or triple the thickness of mortar material surrounding it, resulting in an undesired, excessive gap distance between that brick and the surrounding bricks. The consequence, in the case of the brick wall, is extreme shearing force against the mortar, which

is weak compared to the brick, itself, and the rapid crumbling of the mortar, affecting the eventual ejection of the brick and, eventually, the collapse of the wall. In the case of a cathode used in electrolysis, increased current flow and gap between molecules results in Coulomb forces associated with the substantial current physically pushing columns of aligned oblong molecules out of the cathode entirely. This initial degradation results in Coulomb-induced corrosion spreading from the initial point of damage. That initial gap creates a physical space large enough for newly liberated radial oxygen molecules in the water to enter the void and oxidize the palladium compounds.

By manufacturing these cathodes using a combination of LASER epitaxy and Coulomb Force Line projection/alternation system with molecular granularity, alternating positive and negative forces can, while the molecules are still in a semi-molten state during the deposition process, ensure the alternation of the physical orientation of oblong-shaped palladium compounds in not just two, but three dimensions. With each molecular layer, the positionally alternated oblong molecules of each column (viewed from the outside, in) would resemble ovals in which the ovals with a horizontal orientation are placed atop vertically oriented ovals, but never aligned end-to-end on the Z axis. Provided that the uniformity of this pattern of alternation can be assured, this approach would ensure a greater symmetry of flow than even plus sign or "cross" shaped molecules, as well as greater resistance to the flaking of the material from the overall body than possible when positional orientation is not controlled during the manufacturing process.

## **Conclusion**

Although prevention of material accumulation on the CFL projection surface would pose an engineering challenge, this sort of additive manufacturing technique holds great promise for rendering cost-effective electrolysis-based dissociation of water and other compounds.